C. Amendment to the Claims

This listing of claims will replace all prior versions, and listings, of claims in this application:

Listing of Claims

1. (Currently Amended) A method for obtaining a statistical classifier for classifying spectral data from a biopsy of breast tissue to determine the classification of a characteristic of the breast tissue, comprising:

    (a) locating a plurality of maximally discriminatory subregions in magnetic resonance spectra of biopsies of breast tissue having known classifiers of a characteristic,

    (b) cross-validating the spectra by selecting a portion of the spectra, developing linear discriminant analysis classifiers from said first portion of spectra, and validating the remainder of the spectra using the classifiers from the first portion of the spectra, to obtain optimized linear discriminant analysis coefficients,

    (c) repeating step (b) a plurality of times, each time selecting a different portion of the spectra, to obtain a different set of optimized linear

discriminant analysis coefficients for each of said

plurality of times; and

(d) obtaining a weighted average of the linear

discriminant analysis coefficients to obtain final

classifier spectra indicating the classification of

the characteristic based on the spectra; [and (e)

comparing] wherein spectra from a biopsy of breast

tissue of unknown classification of a characteristic

may be compared to the final classifier spectra to

determine the classification of the characteristic of

the breast tissue.

2.   (Original) The method of claim 1 wherein the step of cross-
validating the spectra comprises cross-validating the
spectra by randomly selecting about half of the spectra.

3.   (Original) The method of claim 1, further including the
step of obtaining a biopsy of breast tissue by a fine
needle aspiration biopsy.

4.   (Original) The method of claim 1, wherein the step of
repeating step (b) a plurality of times comprises repeating
step (b) about 500-1000 times.

5.   (Original) The method of claim 1, further including the steps of obtaining a plurality of final classifier spectra independently, and aggregating the results of the independent classifiers to obtain a consensus diagnosis.

6.   (Original) The method according to claim 1, wherein the characteristic is pathology of the breast tissue and the classification indicates whether the pathology is malignant, benign or normal.

7.   (Original) The method according to claim 1, wherein the characteristic is tumor vascularization, and the classification indicates the extent of tumor vascularization.

8.   (Original) The method according to claim 1, wherein the characteristic is tumor nodal involvement and the classification indicates the extent of tumor nodal involvement.

9.   (Original) An apparatus for obtaining a statistical classifier for classifying spectral data from a biopsy of breast tissue to determine the classification of a characteristic of the breast tissue, comprising:

(a)   a locator for locating a plurality of maximally
       discriminatory subregions in magnetic resonance
       spectra of biopsies of breast tissue having known
       classifiers of a characteristic of breast tissue,

(b)   a cross-validator for selecting a portion of the
       spectra, developing linear discriminant analysis
       classifiers from said first portion of spectra, and
       validating the remainder of the spectra using the
       classifiers from the first portion of the spectra, to
       obtain   optimized   linear   discriminant   analysis
       coefficients,   said   cross-validator   selecting,
       developing and validating a plurality of times, each
       time selecting a different portion of the spectra, to
       obtain   a   different   set   of   optimized   linear
       discriminant analysis coefficients for each of said
       plurality of times, and

(c)   an averager for obtaining a weighted average of the
       linear discriminant analysis coefficients to obtain
       final classifier spectra indicating the classification
       of the characteristic based on the spectra,

whereby spectra from a biopsy of breast tissue of unknown
classification of a characteristic may be compared to the
final classifier spectra to determine the classification of
the characteristic of the breast tissue.

10.   (Original) The apparatus of claim 9 wherein the cross-validator randomly selects about half of the spectra.

11.   (Original) The apparatus of claim 9, wherein the cross-validator repeats step (b) about 500-1000 times.

12.   (Original) The apparatus of claim 9, wherein the characteristic is pathology of the breast tissue and the classification indicates whether the pathology is malignant, benign or normal.

13.   (Original) The apparatus of claim 9, wherein the characteristic is tumor vascularization, and the classification indicates the extent of tumor vascularization.

14.   (Original) The apparatus claim 9, wherein the characteristic is tumor nodal involvement and the classification indicates the extent of tumor nodal involvement.

15.   (Original) A method for determining the classification of a characteristic of breast tissue, comprising:

obtaining magnetic resonance spectra of a biopsy of breast

tissue having unknown classification of a characteristic
and comparing the spectra with a classifier, said
classifier having been obtained by:

(a) locating a plurality of maximally discriminatory
     subregions in the magnetic resonance spectra of
     biopsies of breast tissue having known classifications
     of a characteristic of the breast tissue,

(b) cross-validating the spectra of (a) by selecting a
     portion of spectra, developing linear discriminant
     analysis classifier from said first portion of
     spectra, and validating the remainder of the spectra
     using the classifications from the first portion of
     the spectra, to obtain optimized linear discriminant
     analysis coefficients,

(c) repeating step (b) a plurality of times, each time
     selecting a different portion of the spectra, to
     obtain a different set of optimized linear
     discriminant analysis coefficients for each of said
     plurality of times, and

(d) obtaining a weighted average of the linear
     discriminant analysis coefficients to obtain final
     classifier spectra indicating the classification of
     the characteristic based on the spectra, and

comparing the spectra from the biopsy of breast tissue

having unknown classification to the final classifier spectra to determine the classification of the characteristic of the breast tissue.

16. (Original) The method of claim 15, wherein the characteristic is pathology of the breast tissue and the classification indicates whether the pathology is malignant, benign or normal.

17. (Original) The method of claim 15, wherein the characteristic is tumor vascularization, and the classification indicates the extent of tumor vascularization.

18. (Original) The method of claim 15, wherein the characteristic is tumor nodal involvement and the classification indicates the extent of tumor nodal involvement.

19. (Original) An apparatus for determining the classification of a characteristic of breast tissue, comprising:

a spectrometer for obtaining magnetic resonance spectra of a

biopsy of breast tissue having unknown classification of a

characteristic;

a classifier for statistically classifying the spectra by

comparing the spectra with a reference classifications, said

classifier having been obtained by:

(a)   locating a plurality of maximally discriminatory

       subregions in the magnetic resonance spectra of biopsies

       of breast tissue having known classifications of a

       characteristic of the breast tissue,

(b)   cross-validating the spectra of (a) by selecting a

       portion of spectra, developing linear discriminant

       analysis classifier from said first portion of spectra,

       and validating the remainder of the spectra using the

       classifiers from the first portion of the spectra, to

       obtain optimized linear discriminant analysis

       coefficients,

(c)   repeating step (b) a plurality of times, each time

       selecting a different portion of the spectra, to obtain a

       different set of optimized linear discriminant analysis

       coefficients for each of said plurality of times, and

(d)   obtaining a weighted average of the linear discriminant

       analysis coefficients to obtain final classifier spectra

       indicating the classification of the characteristic based

on the spectra, and

wherein said classifier compares the spectra from the biopsy of breast tissue having unknown classification to the final classifier spectra to determine the classification of the characteristic of the breast tissue.

20.   (Original) The apparatus according to claim 19, wherein the characteristic is pathology of the breast tissue and the classification indicates whether the pathology is malignant, benign or normal.

21.   (Original) The apparatus according to claim 19, wherein the characteristic is tumor vascularization, and the classification indicates the extent of tumor vascularization.

22.   (Original) The apparatus according to claim 19, wherein the characteristic is tumor nodal involvement and the classification indicates the extent of tumor nodal involvement.

23.   (New) A method for obtaining a statistical classifier for classifying spectral data from tissue to determine the classification of a characteristic of the tissue, comprising:

(a)   locating a plurality of discriminatory subregions in

magnetic resonance spectra of tissue having known classifiers of a characteristic,

(b)   cross-validating the spectra by selecting a portion of the spectra, developing linear discriminant analysis classifiers from said first portion of spectra, and validating the remainder of the spectra using the classifiers from the first portion of the spectra, to obtain optimized linear discriminant analysis coefficients,

(c)   repeating step (b) a plurality of times, each time selecting a different portion of the spectra, to obtain a different set of optimized linear discriminant analysis coefficients for each of said plurality of times; and

(d)   obtaining a weighted average of the linear discriminant analysis coefficients to obtain final classifier spectra indicating the classification of the characteristic based on the spectra, wherein spectra from tissue of unknown classification of a characteristic may be compared to the final classifier spectra to determine the classification of the characteristic of the tissue.

24.   (New) An apparatus for obtaining a statistical classifier for classifying spectral data from tissue to determine the classification of a characteristic of the tissue, comprising:

(a)   a locator for locating a plurality of discriminatory subregions in magnetic resonance spectra of tissue having known classifiers of a characteristic of tissue,

(b)   a cross-validator for selecting a portion of the spectra, developing linear discriminant analysis classifiers from said first portion of spectra, and validating the remainder of the spectra using the classifiers from the first portion of the spectra, to obtain optimized linear discriminant analysis coefficients, said cross-validator selecting, developing and validating a plurality of times, each time selecting a different portion of the spectra, to obtain a different set of optimized linear discriminant analysis coefficients for each of said plurality of times, and

(c)   an averager for obtaining a weighted average of the linear discriminant analysis coefficients to obtain final classifier spectra indicating the classification of the characteristic based on the spectra,

whereby spectra from tissue of unknown classification of a characteristic may be compared to the final classifier spectra to determine the classification of the characteristic of the tissue.

25.   (New) A method for determining the classification of a characteristic of tissue, comprising:

obtaining magnetic resonance spectra of tissue having unknown

classification of a characteristic and comparing the spectra

with a classifier, said classifier having been obtained by:

(a)   locating a plurality of discriminatory subregions in the

      magnetic resonance spectra of tissue having known

      classifications of a characteristic of the tissue,

(b)   cross-validating the spectra of (a) by selecting a

      portion of spectra, developing linear discriminant

      analysis classifier from said first portion of spectra,

      and validating the remainder of the spectra using the

      classifications from the first portion of the spectra, to

      obtain optimized linear discriminant analysis

      coefficients,

(c)   repeating step (b) a plurality of times, each time

      selecting a different portion of the spectra, to obtain a

      different set of optimized linear discriminant analysis

      coefficients for each of said plurality of times, and

(d)   obtaining a weighted average of the linear discriminant

      analysis coefficients to obtain final classifier spectra

      indicating the classification of the characteristic based

      on the spectra, wherein the spectra from the tissue

      having unknown classification may be compared to the

      final classifier spectra to determine the classification

      of the characteristic of the tissue.

26.   (New) An apparatus for determining the classification of a

characteristic of tissue, comprising:

a spectrometer for obtaining magnetic resonance spectra of

tissue having unknown classification of a characteristic;

a classifier for statistically classifying the spectra by

comparing the spectra with reference classifications, said

classifier having been obtained by:

(a)   locating a plurality of maximally discriminatory

subregions in the magnetic resonance spectra of tissue

having known classifications of a characteristic of the

tissue,

(b)   cross-validating the spectra of (a) by selecting a

portion of spectra, developing linear discriminant

analysis classifier from said first portion of spectra,

and validating the remainder of the spectra using the

classifiers from the first portion of the spectra, to

obtain optimized linear discriminant analysis

coefficients,

(c)   repeating step (b) a plurality of times, each time

selecting a different portion of the spectra, to obtain a

different set of optimized linear discriminant analysis

coefficients for each of said plurality of times, and

(d)   obtaining a weighted average of the linear discriminant

analysis coefficients to obtain final classifier spectra

indicating the classification of the characteristic based

on the spectra, and

wherein said classifier compares the spectra from the

tissue having unknown classification to the final

classifier spectra to determine the classification of the

characteristic of the tissue.